

CLAIMS

What is claimed is:

1. An optical modulator comprising:
a substrate having an upper surface and a ridge protruding above said upper surface, said ridge extending to a height above said upper surface;
an optical waveguide formed within said substrate, at least a portion of which is formed within said ridge;
a dielectric layer formed on said upper surface of said substrate, said dielectric layer having a height less than or equal to the height of said ridge; and
an electrode formed above said dielectric layer and located adjacent to said ridge.
2. An optical modulator according to claim 1, wherein:
the height of said dielectric layer is equal to the height of said ridge; and
a portion of said electrode contacts an upper surface of said ridge.
3. An optical modulator according to claim 1, wherein:
the height of said dielectric layer is less than the height of said ridge; and
said electrode includes a lower surface located below an upper surface of said ridge.
4. An optical modulator according to claim 3, wherein:
said ridge includes a sidewall; and
a portion of said electrode contacts said sidewall of said ridge.
5. An optical modulator according to claim 1, wherein:
said substrate is formed from a material having a first dielectric constant; and
said dielectric layer is formed from a material having a second dielectric constant that is less than said first dielectric constant.

6. An optical modulator according to claim 5, wherein said substrate is formed from lithium niobate crystal.

7. An optical modulator according to claim 6, wherein said dielectric layer is formed from SU-8.

8. An optical modulator comprising:

a substrate having an upper surface, a first ridge protruding above said upper surface, and a second ridge protruding above said upper surface;

an optical waveguide formed within said substrate, said optical waveguide having a first arm, at least a portion of which is formed within said first ridge, and a second arm, at least a portion of which is formed within said second ridge;

a dielectric section formed on said upper surface of said substrate between said first ridge and said second ridge; and

an electrode formed above said dielectric layer.

9. An optical modulator according to claim 8, wherein:

said substrate is formed from a material having a first dielectric constant; and

said dielectric section is formed from a material having a second dielectric constant that is less than said first dielectric constant.

10. An optical modulator according to claim 8, wherein said electrode is located adjacent to said first ridge.

11. An optical modulator according to claim 10, wherein said electrode is located adjacent to said second ridge.

12. An optical modulator according to claim 8, wherein:

said first ridge extends to a first height above said upper surface of said substrate;

said second ridge extends to a second height above said upper surface of said substrate; and

said dielectric layer extends to a third height above said upper surface of said substrate, said third height being less than or equal to said first height and less than or equal to said second height.

13. An optical modulator according to claim 12, wherein said first height and said second height are equal.

14. An optical modulator according to claim 8, wherein said first ridge and said second ridge are parallel.

15. An optical modulator comprising:

a substrate having an upper surface and a ridge protruding above said upper surface, said ridge dividing said upper surface into a first area and a second area;

an optical waveguide formed within said substrate, at least a portion of which is formed within said ridge;

a first dielectric section formed on said first area of said upper surface, said first dielectric section having a height less than or equal to the height of said ridge;

a second dielectric section formed on said second area of said upper surface, said second dielectric section having a height less than or equal to the height of said ridge;

a first electrode formed above said first dielectric layer; and

a second electrode formed above said second dielectric layer.

16. An optical modulator according to claim 15, wherein said first electrode and said second electrode are each located adjacent to said ridge.

17. An optical modulator according to claim 15, wherein said first electrode is a drive signal electrode and said second electrode is a ground electrode.

18. An optical modulator according to claim 15, wherein:
said substrate is formed from a material having a substrate dielectric constant;
said first dielectric section is formed from a material having a dielectric constant that is less than said substrate dielectric constant; and
said second dielectric section is formed from a material having a dielectric constant that is less than said substrate dielectric constant.

19. An optical modulator comprising:
a substrate having an upper surface, a first ridge protruding above said upper surface, and a second ridge protruding above said upper surface, said first and second ridges dividing said upper surface into a first area between said first and second ridges, a second area adjacent to said first ridge, and a third area adjacent to said second ridge;
an optical waveguide formed within said substrate, said optical waveguide having a first arm, at least a portion of which is formed within said first ridge, and a second arm, at least a portion of which is formed within said second ridge;
a first dielectric section formed on said first area of said upper surface;
a second dielectric section formed on said second area of said upper surface;
a third dielectric section formed on said third area of said upper surface;
a first electrode formed above said first dielectric section;
a second electrode formed above said second dielectric section; and
a third electrode formed above said third dielectric section.

20. An optical modulator according to claim 19, wherein:
each of said first and second ridges extends to a height above said upper surface of said substrate; and
each of said first, second, and third dielectric sections has a height less than the height of said first and second ridges.

21. An optical modulator according to claim 19, wherein:

each of said first and second ridges extends to a height above said upper surface of said substrate; and

each of said first, second, and third dielectric sections has a height equal to height of said first and second ridges.

22. An optical modulator according to claim 19, wherein:

said substrate is formed from a material having a substrate dielectric constant; and

each of said first, second, and third dielectric sections is formed from a material having a dielectric constant less than said substrate dielectric constant.

23. An optical modulator according to claim 19, wherein said first electrode is a drive signal electrode and each of said second and third electrodes is a ground electrode.

24. An optical modulator according to claim 23, wherein said first, second, and third electrodes are configured as a coplanar waveguide transmission line.